Parental and Peer Support in Adolescents With a Chronic Condition: A Typological Approach and Developmental Implications

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Abstract

Research has consistently demonstrated that contextual support is crucial towards the psychological functioning of adolescents with chronic conditions. However, the literature has predominantly focused on parental support instead of adopting an integrated approach to parental and peer support. The present manuscript with two longitudinal studies in adolescents with Type 1 diabetes and congenital heart disease examined the extent to which different clusters of maternal, paternal, and peer support at baseline were related to well- and ill-being over time. In both studies, four clusters emerged: Combined support, Parental support, Peer support, and Lack of support. Follow-up longitudinal analyses indicated that especially Combined support from parents and peers proved to be of crucial importance towards psychological functioning. The present studies demonstrated the value of a typological approach for assessing social support in adolescents with chronic conditions. In addition to focusing on parental support, future research should assess peer support as well in these adolescents.

Keywords: chronic condition; adolescence; parental support; peer support; psychological functioning

Introduction

Adolescence constitutes a crucial period in life in which individuals are confronted with various developmental challenges. For example, becoming less emotionally dependent on parents and establishing intimate friendships are important tasks in adolescence. In addition to these normative development challenges, adolescents with a chronic condition are confronted with substantial non-normative challenges as well, such as integrating their chronic condition in daily life (Seiffge-Krenke, 2001). Although most adolescents with a chronic condition succeed in this task, some adolescents experience more difficulties as compared to healthy peers. For instance, a meta-analysis in adolescents with congenital heart diseases (CHD) revealed they were at risk for internalizing problems (Karsdorp, Everaerd, Kindt, & Mulder, 2007). Further, evidence regarding depressive symptoms in adolescents with Type 1 diabetes (T1D) is inconsistent, with some studies showing higher prevalence rates (Hassan, Loar, Anderson, & Heptulla, 2006), and other studies showing similar prevalence rates as compared to healthy adolescents (Helgeson, Snyder, Escobar, Siminerio, & Becker, 2007). However, irrespective of these diverging prevalence rates, depressive symptoms are an area of concern in these adolescents, as a meta-analysis has demonstrated a significant association between depressive symptoms and treatment non-adherence in patients with T1D (Gonzalez et al., 2008).

In order to optimize psychological functioning in adolescents with chronic conditions, more research is needed concerning potential determinants. Social support systems are important to ensure optimal functioning in adolescents with a chronic condition (Luyckx, Missotten, Goossens, & Moons, 2012). Hence, the present manuscript focuses on perceived parental and peer support in adolescents with chronic conditions, presenting two longitudinal studies: Study 1 focuses on early to mid-adolescents with T1D and Study 2 focuses on mid- to late adolescents with CHD. As compared to T1D, CHD (especially in the case of simple to

moderate lesions) generally has less impact on daily life as it does not require a strict daily treatment regimen. However, adolescents with CHD are confronted with several challenges as well (especially in the case of moderate to complex lesions), such as uncertainty regarding illness course and prognosis, physical activity restrictions, and medical follow-up in order to prevent health complications (Kovacs, Sears, & Saidi, 2005). Although differences exist between both studies, they were combined as this could provide stronger evidence for the importance of assessing combined parental and peer support in different chronic conditions and in different phases of adolescence.

Parental and Peer Support in Adolescence

Cohen (2004) referred to social support as "a social network's provision of psychological and material resources intended to benefit an individual's ability to cope with stress" (p. 676). During adolescence, both parents and peers are important providers of support. Early adolescents are emotionally dependent on their parents for support. However, throughout adolescence, individuals gradually become less emotionally dependent on their parents, a process which peaks in late adolescence (Beyers, 2001). Simultaneously, peer relations become more intimate and adolescents increasingly rely on their peers for support. By late adolescence, individuals prefer to spend most of their time with peers and to go to peers when they feel sad (Ainsworth, 1989). However, despite these changes, parents continue to play an important role for the provision of support (Collins & Laursen, 2004).

Parental support has been demonstrated to relate consistently to adolescents' psychological functioning (Helgeson et al., 2014). Supportive parents indeed make adolescents create a view of themselves as valuable and competent (Bowlby, 1969), which has been demonstrated to be related to adolescents' psychological functioning (Orth, Robins, & Roberts, 2008). Hence, parental support may be especially important for adolescents with a chronic condition, as parents need to support adolescents in increasingly taking care of themselves and

their illness (Seiffge-Krenke, 2001). Parental support indeed negatively predicted depression and loneliness, and positively predicted quality of life nine months later in adolescents with CHD (Luyckx, Goossens, et al., 2012; Luyckx, Missotten, et al., 2012). In adolescents with T1D, parental support has been found to predict better treatment adherence (La Greca et al., 1995) and less depressive symptoms (Butler, Skinner, Gelfand, Berg, & Wiebe, 2007).

Research on healthy adolescents has shown that peers become increasingly important as an additional source of support throughout adolescence, as peer relations become more intimate (Collins & Laursen, 2004). Similarly, research in adolescents with T1D has shown that adolescents relied more on peers than parents for emotional support (La Greca et al., 1995). Further, peer support in adolescents with different chronic conditions was related to significant improvements in adolescents' emotional symptoms, and to increased quality of life (Kohut, Stinson, van Wyk, Giosa, & Luca, 2014). Peer support could relate to adaptive psychological functioning, partially because adolescents discuss problems with their peers which could result in the use of more adaptive coping strategies when dealing with everyday problems (Rubin, Bukowski, Parker, & Bowker, 2008). In addition, peer support has been demonstrated to be important towards identity development (Rassart, Luyckx, Apers, Goossens, & Moons, 2012), being a core developmental task of adolescence and which has been related to adaptive psychological functioning in both healthy and chronically ill adolescents (Luyckx, Goossens, Van Damme, & Moons, 2011; Luyckx et al., 2008).

With respect to social support in adolescents with chronic conditions, four gaps can be identified in previous research. First, although peers become an increasingly important source of social support during adolescence, most research in chronic conditions has focused on parental support (Rassart et al., 2012). Second, previous research has mainly focused on parental and peer support separately in relation to psychological functioning. However, research in adolescents with and without a chronic condition has demonstrated the importance of a

combined approach in studying parental and peer support. For instance, one study in 4-16 years olds with a chronic condition has demonstrated parental and peer support to be independently related to psychological functioning (Wallander & Varni, 1989). More recent studies have demonstrated that either parental or peer support is related to better psychological functioning as compared to when no support is experienced, as supportive relationships in one domain could protect against adverse effects of impaired relationships in the other domain (Helgeson et al., 2014). Third, most studies focused on maternal support, excluding paternal support. However, recent research has demonstrated that paternal support predicted psychological functioning of adolescents with CHD nine months later (Luyckx, Goossens, et al., 2012). Consequently, the present studies focused on both maternal and paternal support, in addition to peer support.

Finally, although several studies have demonstrated the importance of parental and peer support for adolescents with a chronic condition, they did not apply a typological approach in studying support. However, such a typological approach allows for investigating the degree to which different sources of social support co-occur in adolescents with a chronic condition. In other words, it allows to discover different social support groups and how many adolescents can be assigned to these groups. As such, vulnerable groups of adolescents can be identified. In sum, the present manuscript examined clusters of maternal, paternal, and peer support in adolescents with a chronic condition, and how these clusters were related to psychological functioning over time. We focused on two chronic conditions (i.e., T1D and CHD) to examine communalities and potential differences.

Research Objectives and Hypotheses

The aims of the present studies were twofold. First, we identified different social support clusters based on maternal, paternal, and peer support in adolescents with and without a chronic condition in order to compare these clusters between adolescents with and without a chronic condition. The present studies relied on cluster analysis to partition participants into mutually

exclusive groups. In contrast to techniques such as median-split, cluster analysis does not rely on arbitrary cut-offs for classification. Its purpose is to classify individuals into relatively homogeneous groups in such a way that individuals within one cluster have more in common than with the participants assigned to other clusters (Gore, 2000). Due to the fact that cluster-analysis is a data-driven procedure, any number of clusters could be identified. Hence, we did not have strong expectations regarding the number of clusters that would emerge. Based on previous research, we expected at least four clusters to emerge (Wallander & Varni, 1989) . A first cluster would include adolescents scoring high on all three sources of support (Combined support), whereas a second cluster would include adolescents scoring low on all three sources of support (Lack of support). We also expected two clusters to emerge characterized by either parental (i.e., maternal and paternal) or peer support only (Parental support and Peer support, respectively). Several other clusters could emerge as well, such as a cluster scoring high on maternal support, but low on paternal and peer support. As previous research has found little to no differences in levels of parental and peer support between adolescents with and without a chronic condition (Pinquart, 2013; Spirito, DeLawyer, & Stark, 1991), we expected adolescents with and without a chronic condition to be equally distributed among the clusters.

Second, we examined how these clusters were related to psychological functioning in patients over time. Psychological functioning is generally conceptualized as consisting of two dimensions: (1) a positive one, well-being, as indicated by, for instance, satisfaction with life and positive affect; (2) and a negative one, ill-being, as indicated by, for instance, negative affect and internalizing symptoms (Diener, 2006). Although we focused on somewhat different indicators of well- and ill-being in both studies, clear resemblances existed between both studies. With respect to well-being, both studies assessed a combination of positive evaluations individuals make regarding different domains of life. Whereas Study 1 assessed indicators such as body image, mastery of external world, emotional health, and superior adjustment, Study 2

assessed physical and emotional functioning and quality of life. Hence, both operationalizations of well-being focused on emotional and physical/bodily functioning. With respect to ill-being, both studies focused on internalizing symptoms, referring to inner disturbances such as anxiety and depressive symptoms (Achenbach, 1991). Whereas Study 1 focused on internalizing symptoms more broadly defined (including depressive symptoms, anxiety, and social withdrawal), Study 2 focused specifically on depressive symptoms. Hence, as noted, both operationalizations of internalizing symptoms are related and again allow for drawing parallels across both studies. To our knowledge, no previous studies have focused on different social support clusters in relation to patients' psychological functioning over time. However, based on previous research that focused on parental or peer support in relation to psychological functioning, in the introductory sections to each of the studies we forward some tentative hypotheses with regard to the four hypothesized clusters. In addition to psychological functioning, we also focused on an important biological treatment outcome (i.e., glycemic control) in Study 1, which will be discussed below.

STUDY 1

T1D is the most common metabolic disease in childhood and adolescence, requiring a complex daily treatment regimen involving monitoring of blood glucose levels, insulin administration, diet, and exercise (Seiffge-Krenke, 2001). Treatment adherence is necessary in order to maintain near-normal levels of glycemic control, which prevents serious health complications in T1D. Glycemic control (as indexed by HbA1c-levels) is an important biological treatment outcome and reflects the status of a patient's metabolic adaptation (i.e., blood glucose levels) (Seiffge-Krenke, 2001). As psychological ill-being (e.g., depressive symptoms) has demonstrated to be associated with treatment non-adherence in patients with T1D (Gonzalez et al., 2008), optimizing psychological functioning is of crucial importance. Both parental and peer support have been demonstrated to be related to the psychological

functioning of adolescents with T1D (La Greca et al., 1995). Further, parental support, but not peer support, has been demonstrated to relate to better treatment adherence (but not directly to better glycemic control) (Helgeson et al., 2014).

Because both parents and peers are important sources of social support, we expected that adolescents in the Combined support cluster would show less internalizing symptoms, and better well-being over time than adolescents in the remaining clusters (Wallander & Varni, 1989). Further, we expected that the experience of either parental or peer support would be related to less internalizing symptoms and better well-being over time as compared to the experience of no support (Helgeson et al., 2014). As early adolescents are still very emotionally dependent on their parents for support (Beyers, 2001), we expected the Parental support cluster to be related to less depressive symptoms and better well-being over time as compared to the Peer support cluster. Finally, we also focused on glycemic control. As parental support has been related to better treatment adherence, we tentatively expected that the Combined and Parental support clusters would score somewhat better on glycemic control. However, this hypothesis was forwarded cautiously, as previous research found no direct association between parental support and glycemic control (Helgeson et al., 2014).

Methods

Participants and Procedure

A total of 228 early to mid-adolescents (M_{age}=13.9 years; *SD*=1.28; 52% girls) participated at T(ime)1 of a four-wave longitudinal study with 12-months measurement intervals; 109 had T1D and 119 were healthy controls. Adolescents came from broad socio-economic strata: 52% of the families were middle-class. All of the fathers and 65% of the mothers were employed. With regard to family situation, 81% of adolescents was raised in two-parent families and 19% in single-parent or divorced families. This study received full Institutional Review Board approval and all adolescents and parents provided informed

consent. Adolescents with T1D were recruited from 17 pediatric health care services offering outpatient care in two German cities. Inclusion criteria were: between 11-15 years of age at T1 and no additional chronic diseases. Healthy adolescents were recruited in various high schools. At each time point, adolescents were visited at home and were asked to fill out questionnaires. In patients, mean illness duration at T1 was 4.95 years (*SD*=3.48). Adolescents with and without diabetes did not differ on age and gender (Seiffge-Krenke, 2001).

Retention rates were high with 83% of patients participating at T1-4 (with 12-months interval). Participants with and without complete data were compared using Little's (1988) Missing Completely At Random (MCAR) test. A non-significant MCAR test ($\chi^2(221)=206.47$, $p=.75$) indicated that all missing values could be reliably dealt with. Accordingly, we used full information maximum likelihood (FIML) in MPLUS 6.0 (Muthén & Muthén, 2002), resulting in more reliable estimates as compared to conventional methods such as listwise deletion (Enders, 2010).

Measures

Parental support. At T1, maternal and paternal support were assessed separately with the Network of Relationships Inventory (NRI; Furman & Buhrmester, 1985). The subscales satisfaction, affection, instrumental aid, reliable alliance, companionship, intimacy, admiration, nurturance, conflict, and relative power were assessed, with three items per subscale. Items were rated on a scale ranging from 1 (*little or none*) to 5 (*the most*) for mother and father separately. The instrument yields three factors (i.e., general support, negative interactions, and relative power) with the first 8 subscales loading on the maternal/paternal support factor; hence, these 8 subscales were averaged for the present study (other subscales were not considered) (Laursen & Mooney, 2008). A sample item includes "How much does your mother/father help you when you need to get something done?".

Peer support. At T1, peer support was assessed with the Inventory of Parent and Peer Attachment (IPPA) (Armsden & Greenberg, 1987), tapping into the quality of communication, the degree of trust, and alienation in peer relationships (12 items). Adolescents responded using a 4-point scale, from 1 (*never*) to 4 (*always*). A sample item reads: "My friends stimulate me to talk about my problems". Cronbach's alphas were .83 in patients and .79 in controls.

Internalizing symptoms. At T1-4, internalizing symptoms were assessed by the Youth Self-Report (YSR; Achenbach, 1991). With a total of 102 items (to be rated as 0 [*not true*], 1 [*somewhat or sometimes true*], and 2 [*often or very often true*]), the YSR consists of multiple syndrome scales, which can be combined in two broad-band scales: internalizing (e.g., "I feel lonely") and externalizing scale (e.g., "I get in many fights"). Sum scores were computed for the total Internalizing scale. Norms, reliability, and validity of the German YSR have been established (Lösel, Bliesener, & Köferl, 1991). Cronbach's alphas for internalizing symptoms ranged from .85 to .90 at T1-4.

Well-being. At T1-4, patients completed the Offer Self-Image Questionnaire (Offer, Ostrov, Howard, & Dolan, 1989), which has been proven to be reliable and valid in German adolescents (Seiffge-Krenke, 1990). In line with previous research (Luyckx & Seiffge-Krenke, 2009), the scales assessing psychological self (impulse control, emotional tone, and body image) and coping self (mastery of external world, emotional health, and superior adjustment) were combined to assess well-being or general positive self-concept. A sample items reads: "Most of the time, I am happy".

Glycemic control. At T1-4, patients visited their physicians to determine HbA_{1c}-values and questionnaires were sent to the physicians to obtain these values. HbA_{1c} is a commonly used measure of glycemic control and represents the mean blood glucose concentration for the 6-8 weeks preceding the test. Higher HbA_{1c}-values indicate poorer glycemic control.

Statistical Analyses

Statistical analyses proceeded in four steps. (1) Cluster analysis was conducted using a two-step procedure (Gore, 2000) on the combined sample of adolescents. Only individuals with scores on all three support variables (i.e., maternal, paternal, and peer support) at T1 were included. Further, prior to this analysis, we removed 13 univariate (i.e., values more than 3 *SD* below or above the mean) and multivariate outliers (i.e., individuals with high Mahalanobis distance values), reducing our sample to 193 adolescents. In a first step, hierarchical cluster analysis, based on squared Euclidian distances, was carried out using Ward's method for 2 through 5 clusters. In a second step, the initial cluster centers were used as non-random starting points in iterative *k*-means cluster analysis. A cluster solution was selected based on parsimony, interpretability, and explanatory power (i.e., the solution had to explain 50% of the variance in the support variables). (2) Using chi-square analysis, we examined whether adolescents with and without diabetes would be distributed differently among the clusters. (3) This same clustering procedure was repeated for adolescents with diabetes (after removing 8 univariate and multivariate outliers) and associations with age, gender, and illness duration were examined through chi-square analysis or ANOVA. (4) Multigroup latent growth curve modeling (LGCM) estimates two attributes of change for each participant: the initial level, or *intercept*, and the rate of change across time, or *slope*. The means of intercepts and slopes represent the average developmental trajectories. LGCM was conducted to investigate whether mean intercepts or slopes of the outcome variables (i.e., internalizing symptoms, well-being, and HbA_{1c}) differed among the clusters. The path from the linear slope to the indicator at T1 was fixed to 0 so that the mean intercept would represent the initial level. Subsequent linear slope pattern coefficients were fixed at 1, 2, and 3 for T2, 3, and 4, respectively. Standard fit indices were used. The chi-square index should be as small as possible, with $\chi^2/df < 2$; RMSEA should be < .08 and preferably < .06; and CFI should be > .90 and preferably > .95 (Hu & Bentler, 1999; Kline, 2005). First, for each outcome variable, a fully unconstrained baseline model was estimated.

Next, we re-estimated the model with intercepts constrained equal across clusters. Finally, in a third model, we constrained linear (and, if applicable, quadratic) slopes equal across clusters. If these latter two constrained models provided a significantly poorer fit compared to the baseline model, this suggests that the clusters differ from one another on the parameters tested. Using follow-up multigroup models we examined which intercepts or slopes could be held equal across each possible pair of clusters. Differences in chi-square values between constrained and unconstrained models, relative to degrees of freedom, indicated whether parameters could be held equal.

Results

Objective 1: Cluster-Analysis

In the combined sample, four clusters were retained. These clusters explained more than 50% of the variance in maternal (58%), paternal (67%), and peer support (68%): Combined support (high scores on all support variables; 40.4% of the sample), Parental support (high scores on maternal and paternal support, and low scores on peer support; 16.1%), Peer support (high scores on peer support, and low scores on maternal and paternal support; 24.3%), and Lack of support (low scores on all support variables; 19.2%). Adolescents with and without diabetes were equally distributed among the clusters ($\chi^2(3)=3.24$, $p=.36$).

Next, using the initial clusters centers of the combined sample (due to the relatively small sample of adolescents with diabetes and the fact that patients and controls were equally distributed among the four clusters), these same four clusters were found in adolescents with diabetes (as displayed in Figure 1): Combined support (43.8% of the sample), Parental support (19.1%), Peer support (22.5%), and Lack of support (14.6%). This solution explained 65% of the variance in maternal support, 69% in paternal support, and 65% in peer support. No age ($F(3, 85)=2.26$, $p=.09$, $\eta^2=.07$), illness duration ($F(3, 85)=0.56$, $p=.64$, $\eta^2=.02$), or sex differences ($\chi^2(3)=2.71$, $p=.44$) were found among the clusters.

Objective 2: Associations with Psychological Functioning

Multigroup LGCM was used to examine differences among the clusters on outcomes over time. For internalizing symptoms, a model with intercept and linear slope terms provided the best fit to the data, whereas for well-being and HbA_{1c}, a model with intercept and linear and quadratic slope terms provided the best fit to the data. All parameter estimates of the unconstrained models are displayed in Table 1. Within each row, parameters differ at $p < .05$ if they have different superscripts, and parameters without superscripts do not differ significantly from other parameters.

For internalizing symptoms, the unconstrained model had an acceptable fit, except for the RMSEA ($\chi^2(24)=36.47$, $p=.05$, $\chi^2/df=1.52$; RMSEA=.153; CFI=0.945). However, readers should note that complex models with a low *N* can have artificially large values of the RMSEA, even to the extent that Kenny, Kaniskan, and McCoach (2014) argue to not interpret the RMSEA in such cases. Constraining intercepts equal among the clusters marginally decreased model fit ($\Delta\chi^2(3)=7.65$, $p=.05$). Follow-up analyses indicated that (with $\Delta\chi^2(1)$ accompanied by $p<.05$) the Combined support cluster had a lower intercept as compared to the Lack of support cluster. The Peer support cluster was situated in-between. Further, all slopes could be constrained as equal among the clusters ($\Delta\chi^2(3)=0.81$, $p=.85$).

For well-being, the unconstrained model had an acceptable fit, except again for the RMSEA ($\chi^2(18)=32.39$, $p<.05$, $\chi^2/df=1.80$; RMSEA=.190; CFI=0.908). Constraining intercepts equal among the clusters significantly decreased model fit ($\Delta\chi^2(3)=23.19$, $p<.001$). Follow-up analyses indicated that (with $\Delta\chi^2(1)$ accompanied by $p<.05$) the Combined support and Parental support clusters had the highest intercept, whereas the Peer support and Lack of support cluster had the lowest intercept. Further, constraining slopes equal among the clusters marginally decreased model fit ($\Delta\chi^2(6)=12.14$, $p=.06$). The linear and quadratic slopes in the Peer support

and Lack of support clusters differed significantly from the Parental support cluster, with well-being decreasing across the first time-points especially in the Parental support cluster.

Finally, for HbA_{1c}, the unconstrained model had an acceptable fit, except again for the RMSEA ($\chi^2(8)=9.60$, $p=.29$, $\chi^2/df=0.83$; RMSEA=.096; CFI=0.947). All intercepts ($\Delta\chi^2(3)=3.70$, $p=.30$) and slopes ($\Delta\chi^2(6)=8.79$, $p=.19$) could be constrained as equal among the clusters.

STUDY 2

To examine parental and peer support in adolescents with other chronic conditions, Study 2 focused on CHD. CHD is the most frequent birth defect (9:1000 births) and comprises a wide spectrum of simple, moderate, and complex structural heart lesions (van der Linde et al., 2011). Due to advances in pediatric cardiology and cardiac surgery, almost 90% of children with CHD survive into adulthood (Moons, Bovijn, Budts, Belmans, & Gewillig, 2010). Treatment and follow-up in CHD depends on the complexity of the heart defect. However, general health-promoting behaviors are of crucial importance for all patients to avoid complications such as arrhythmias and heart failure. Hence, a long-term follow-up throughout the lifespan is needed to decrease rates of morbidity and mortality (Kovacs et al., 2005). As compared to T1D, CHD (especially in the case of simple to moderate lesions) generally has less impact on daily life. However, adolescents with CHD (especially in the case of moderate to complex lesions) are still confronted with substantial challenges (e.g., uncertainty regarding illness course and prognosis, physical limitations, school absences), putting them at risk for suboptimal psychological functioning (Karsdorp et al., 2007). Recent research has demonstrated that parental and peer support predicted psychological functioning in adolescents with CHD over time (Luyckx, Missotten, et al., 2012).

We expected that adolescents in the Combined support cluster would show less depressive symptoms and better well-being over time as compared to adolescents in the

remaining clusters. Further, we expected that the Parental support and Peer support clusters would be related to less depressive symptoms and better well-being over time as compared to the Lack of support cluster. Finally, by late adolescence individuals prefer to spend most of their time with peers and to go to peers when they feel sad (Ainsworth, 1989). As we focused on mid- to late adolescents at baseline in Study 2, we expected peer support to be relatively more important as compared to parental support, which implies that the Peer support cluster would be related to less depressive symptoms and better well-being over time as compared to the Parental support cluster.

Methods

Participants and Procedure

As part of the four-wave longitudinal project i-DETACH (Information technology Devices and Education programme for Transitioning Adolescents with Congenital Heart disease) with 9-months measurement intervals, patients were selected from the database of pediatric and congenital cardiology of the University Hospitals Leuven, Belgium. The study was approved by the Institutional Review Board. At T1, 498 patients met the inclusion criteria: confirmed diagnosis of CHD, defined as structural abnormalities of the heart and/or great intrathoracic vessels that are actually or potentially of functional significance (Mitchell, Korones, & Berendes, 1971); aged 14-18 years; last cardiac outpatient visit at our tertiary care centre performed ≤ 5 years ago; and being able to read and write Dutch. Patients were excluded if they had cognitive and/or physical limitations that inhibit them to fill out questionnaires, and if they previously underwent heart transplantation. All eligible adolescents received a package by surface mail, including a set of questionnaires, an information letter, an informed consent form (for parents and adolescents), and a pre-stamped and addressed return envelope.

A total of 429 mid- to late adolescents (M_{age}=15.75 years; *SD*=1.14; 46.6% girls) participated at T1. Clinical information was obtained from medical records. The primary heart

defect was categorized using a modified version of the scheme developed by the CONCOR (CONgenital COR Vitia) project (Vander Velde et al., 2005). Patients were categorised according to disease complexity by using the classification of the Task Force 1 of the 32nd Bethesda conference: simple (40% of the sample), moderate (48%), or complex (12%) (Warnes et al., 2001). Patients had different educational levels: general secondary (43.6%), technical secondary (31.0%), vocational secondary (19.4%), and other education (6.1%). With regard to family situation, 77.1% of the adolescents was raised in two-parent families, 15.3% was raised in divorced families, 1.2% had lost a parent, 5.7% had a stepparent, and 0.7% was raised in a different situation. As in Study 1, retention rates were quite high with 70% of patients participating at T1-4 (with 9-months intervals). A non-significant MCAR test statistic ($\chi^2(795)=848.96$; $p=.09$) suggested that all missing values could be reliably dealt with. Hence, as in Study 1, we used FIML.

At T1, a control group was recruited at secondary schools. Participants had different educational levels: general secondary (48.4%), technical secondary (33.4%), and vocational secondary (18.2%). With regard to family situation, 74.7% of the adolescents was raised in two-parent families, 17.4% was raised in divorced families, 1.2% had lost a parent, 4.5% had a stepparent, and 2.2% was raised in a different situation. These adolescents completed questionnaires during a regular class hour supervised by two psychology students. Parents were provided with written information about the research and were asked for their consent for the adolescent to participate. A total of 403 (94.0%) adolescents with CHD at T1 could be matched with a control individual based on gender and age.

Measures

Parental support. At T1, maternal and paternal support were assessed separately using the responsiveness scale (7 items) from the Child Report of Parent Behavior Inventory (Schludermann & Schludermann, 1988). Responsiveness refers to the degree to which

adolescents experience emotional support and warmth from their parents. Adolescents responded using a 5-point scale, from 1 (*strongly disagree*) to 5 (*strongly agree*). A sample item reads: "My mother/father makes me feel better after talking over my worries with her/him". Cronbach's alpha were .91 for maternal and .91 for paternal support in patients; and .90 for maternal and .89 for paternal support in controls.

Peer support. At T1, similar to Study 1, the peer subscales of the short form of the IPPA were used (Armsden & Greenberg, 1987). Cronbach's alphas were .81 in patients and .83 in controls.

Depressive symptoms. At T1-4, adolescents with CHD completed the 20-item Center for Epidemiologic Studies Depression Scale (Bouma, 1995). Each item asks how often participants had experienced symptoms of depression during the past week, using a 4-point scale from 0 (*seldom*) to 3 (*most of the time or always*). A scale score was calculated by summing all items (range 0-60). A sample item reads "During the last week, I felt depressed". Cronbach's alphas ranged between .89 and .91 at T1-4.

Well-being. Similar to Study 1, well-being was assessed using multiple indicators at each time-point (i.e., quality of life, emotional, and physical functioning). First, quality of life (QOL) was defined as the degree of overall life satisfaction that is positively or negatively influenced by individuals' perception of certain important aspects of life, both related and unrelated to health (Moons, 2004). Overall QOL was assessed using a Linear Analogue Scale (LAS), which is a vertically oriented line, graded with indicators ranging from 0 (*worst imaginable quality of life*) to 100 (*best imaginable quality of life*). Patients were asked to rate their QOL by marking a point on this scale. Validity and reliability of the LAS for CHD have been reported elsewhere (Moons et al., 2006). Second, emotional and physical functioning were assessed with 8 items each using the Pediatric Quality of Life Inventory™ 4.0 (PedsQL; Uzark, Jones, Burwinkle, & Varni, 2003). The degree to which adolescents experienced problems

during the past month was rated on a scale ranging from 0 (never) to 4 (almost always). These scores were transformed into a 0 to 100 scale with a higher score reflecting better functioning. Cronbach's alphas ranged from .72 to .90 for emotional and physical functioning at T1-4. Exploratory factor analysis at T1 indicated that one factor (as indicated by the scree plot and eigenvalue-larger-than-1 criterion) accounted for 61.9% of the variance. Hence, similar to Study 1, an encompassing well-being factor was computed at each time-point by calculating the mean of quality of life, emotional functioning, and physical functioning.

Statistical Analyses

Statistical analyses proceeded in four steps. (1) Two-step cluster analysis was again conducted on the combined sample. Only individuals with scores on all three support variables (i.e., maternal, paternal, and peer support) at T1 were included. Prior to conducting this analysis, we removed 20 outliers, reducing our sample to 765 adolescents. (2) Using chi-square analysis, we examined whether adolescents with CHD and community adolescents would be distributed differently among the clusters. (3) The same clustering procedure was repeated for adolescents with CHD (after removing 12 outliers) and associations with age, gender, and CHD complexity were examined through chi-square analysis or ANOVA. (4) Similar to Study 1, multigroup LGCM was conducted to investigate whether intercepts or slopes of the outcome variables (i.e., depressive symptoms and well-being) differed among the clusters.

Results

Objective 1: Cluster-Analysis

In the combined sample, four clusters were retained. These clusters were in line with Study 1 and explained approximately 50% of the variance in maternal (56%), paternal (55%), and peer support (49%): Combined support (26.8% of the sample), Parental support (24.3%), Peer support (24.7%), and Lack of support (24.2%). Adolescents with CHD and community adolescents were differentially distributed among these clusters ($\chi^2(3)=29.63$, $p<.001$).

Standardized residuals indicated that, whereas 33.1% of patients belonged to the Combined support cluster, only 19.6% of community adolescents did so. Relatedly, whereas 18.6% of patients belonged to the Lack of support cluster, 30.5% of community adolescents did so. Hence, adolescents with CHD experienced more support as compared to healthy peers.

In adolescents with CHD, these same four clusters emerged again (as displayed in Figure 2) and explained 62% of the variance in maternal, 51% in paternal, and 54% in peer support: Combined support (27.2%), Parental support (26.7%), Peer support (25.4%), and Lack of support (20.7%). No age ($F(3, 397)=1.00$, $p=.39$, $\eta^2=.01$) or illness complexity differences ($\chi^2(6)=1.91$, $p=.92$) were found. Sex differences were found ($\chi^2(3)=8.71$, $p<.05$): boys as compared to girls were overrepresented in the Parental support cluster (63.6% vs. 36.4%), but underrepresented in the Combined support cluster (44.0% vs. 56.0%).

Objective 2: Associations with Psychological functioning

Multigroup LGCM was used to examine differences among the clusters on outcomes over time. For both outcome variables, a model with intercept, linear, and quadratic slope terms provided the best fit to the data. All parameter estimates of the unconstrained models are displayed in Table 1. Ancillary analyses additionally controlling for sex (by regressing all growth parameters on sex) resulted in virtually identical parameter estimates. For depressive symptoms, the unconstrained model had an adequate fit ($\chi^2(17)=25.12$, $p=.09$, $\chi^2/df=1.48$; RMSEA=.069; CFI=0.981). Constraining intercepts equal among the clusters decreased model fit ($\Delta\chi^2(3)=52.75$, $p<.001$). Follow-up analyses indicated that (with $\Delta\chi^2(1)$ accompanied by $p<.05$) the Combined support cluster had the lowest intercept, whereas the Parental support and Lack of support clusters had the highest intercepts. The Peer support cluster was situated in-between. Further, all slopes could be constrained as equal among the clusters ($\Delta\chi^2(6)=11.26$, $p=.08$).

For well-being, the unconstrained model had an adequate fit ($\chi^2(14)=9.51$, $p=.80$, $\chi^2/df=0.68$; RMSEA=.000; CFI=1.000). Whereas intercepts could not be constrained as equal ($\Delta\chi^2(3)=23.53$, $p=.01$), slopes could be constrained as equal ($\Delta\chi^2(6)=5.23$, $p=.52$). Combined support had the highest intercepts, whereas Parental support and Lack of support had the lowest intercepts. Peer support was again situated in-between.

General Discussion

Adolescents with a chronic condition, such as T1D and CHD, have been found to be at risk for suboptimal psychological functioning (Karsdorp et al., 2007). The present manuscript focused on social support as a potential determinant of psychological functioning. Two longitudinal studies were presented that examined the extent to which different clusters of maternal, paternal, and peer support at baseline predicted psychological functioning over time. Despite the differences between both studies (e.g., different chronic conditions, ages, and measures used), similar clusters and partly similar associations with psychological development were found in both studies. Findings demonstrated that both parents and peers constituted important sources of social support for both adolescents with T1D and CHD, which is in line with adolescents' normative development. Peers increasingly become a source of social support through adolescence, whereas parents remain a source of support as well (Collins & Laursen, 2004).

Social Support Clusters and Comparison with Healthy Peers

As expected, four social support clusters were identified: Combined support (high scores on all support variables), Parental support (high scores on maternal and paternal support, and low scores on peer support), Peer support (high scores on peer support, and low to moderate scores on maternal and paternal support), and Lack of support (low scores on all support variables). The combined presence of maternal and paternal support was found to be important (Luyckx, Goossens, et al., 2012). Paternal support might become especially important for

adolescents with a chronic condition, as fathers tend to encourage independence more than mothers do (Shulman & Seiffge-Krenke, 1997). This seems important given that parental involvement in illness care may conflict with adolescents' increasing independence (Seiffge-Krenke, 2001). For the present studies, as maternal and paternal support displayed similar scores within each of the clusters, we will refer to parental support in the remainder of the discussion.

Chronically ill adolescents of different ages, with different illness durations, and different illness complexities were equally distributed among these clusters. For adolescents with CHD, but not T1D, girls as compared to boys were slightly overrepresented in the Combined support cluster, but slightly underrepresented in the Parental support cluster. In sum, this pattern of findings suggests that the amount of social support (and the source from which it originates) experienced by adolescents with a chronic condition does not seem to depend on age, sex, illness duration, or illness complexity.

Further, as expected, adolescents with T1D were equally distributed among the social support clusters as compared to healthy peers. This finding suggests that, although parents tend to be strongly involved in adolescents' daily diabetes treatment (Seiffge-Krenke, 2001), they provided a degree of support that is adjusted to adolescents' developmental level (Collins & Laursen, 2004). Further, although meeting the demands of diabetes treatment may have an impact on peer dynamics, adolescents with T1D felt equally supported by peers as compared to healthy peers (Seiffge-Krenke, 2001).

Rather unexpectedly, adolescents with CHD were more frequently assigned to the Combined support cluster, but less frequently to the Lack of support cluster, as compared to healthy peers. Although these findings are partially in line with previous findings showing that adolescents with CHD do not show impaired parent-child and peer relationships (Kovacs et al., 2005), research should focus on the mechanisms underlying such increased perceived support

in patients. Although such perceptions may reflect actual differences in social support, one explanation might also be response shift, which refers to changes in internal standards or values induced by a chronic condition. Hence, individuals with a chronic condition could attain different standards for evaluating relationships, potentially leading to a more positive evaluation (Rapkin & Schwartz, 2004).

Social Support Clusters and Psychological Development

In a next step, we examined differences in the psychological development of adolescents with a chronic condition belonging to these clusters. As expected, in both studies, adolescents in the Combined support cluster generally showed better psychological functioning (i.e., lower depressive/internalizing symptoms and higher well-being) over time than adolescents in the Lack of support cluster. This finding is in line with previous research demonstrating the importance of combined parental and peer support (e.g., Wallander & Varni, 1989). The combined support from parents and peers might enable adolescents to cope with normative and illness-specific challenges, which, in turn, is related to better psychological functioning (Seiffge-Krenke, 2001).

Interestingly, differences in psychological functioning were found between both studies. In Study 1, adolescents in the Parental support cluster showed better well-being as compared to adolescents in the Peer support cluster. However, in Study 2, adolescents in the Peer support cluster showed less depressive symptoms and better well-being than those in the Parental support cluster. At least two tentative explanations can be forwarded. First, Study 1 focused on early- to mid-adolescence, whereas Study 2 focused on mid- to late-adolescence. This finding suggests that peer support is more strongly related to psychological functioning in mid- to late adolescents than in early to mid-adolescents, which is in line with a developmental point of view. By late adolescence, individuals indeed prefer to spend most of their time with peers and to go to peers when they feel sad (Ainsworth, 1989), which might explain the stronger relations

with psychological functioning. Second, T1D (Study 1) requires a strict daily treatment regimen, in contrast to CHD. Parents need to support adolescents in increasingly taking care of their diabetes (Seiffge-Krenke, 2001) and parental involvement in treatment management stays important throughout adolescence (King et al., 2012). Consequently, parental support might be more important in relation to daily functioning for adolescents with T1D than for adolescents with CHD.

In general, no changes in psychological functioning within each of the clusters were found over time, meaning that the differences among the clusters in psychological functioning remained fairly stable over time. However, one exception was found, as well-being in Study 1 decreased for adolescents in the Combined and Parental support clusters. However, at Time 1, individuals belonging to these clusters reported the highest levels of well-being, indicating that these decreases over time could represent some sort of regression to the mean.

Finally, social support was not related to glycemic control in adolescents with T1D, which might be a result of the assessment of general support instead of diabetes-specific support. Disease-specific parental support indeed has been related to better glycemic control via treatment adherence (Carcone, Ellis, Naar-King, & Weisz, 2011). However, general parental support was also related to better treatment adherence (Helgeson et al., 2014). Thus, although our results provide no support for a direct relationship between general parental support and glycemic control, an indirect relationship through treatment adherence might still exist.

These results can have important clinical implications, because the four social support clusters and their relations with psychological functioning were replicated in different chronic conditions. Our findings suggest that clinical practice should not only focus on parents, but also on peers as a source of social support. Adolescents who experience no or either parental or peer support might be more vulnerable for less optimal functioning. Careful screening to identify

these adolescents is an important first step and intervention and prevention should focus on how these adolescents can feel more supported by parents and peers. In addition, it seems advisable to involve both parents and peers in such interventions if necessary.

Limitations and Suggestions for Future Research

First, although the use of two studies is a strength, differences exist between both studies. We focused on two different patient samples with different chronic conditions and different ages. We also used somewhat different indicators for the core constructs of ill- and well-being. However, the fact that we found similar results in both studies despite these methodological differences between both studies testifies to the broader utility and relevance of assessing parental and peer support combined in these adolescents. In addition to this general finding, future research should focus on other, more specific indicators of ill- and well-being as well in order to better understand the specific functions of parental and peer support.

Second, both studies are mainly based on self-report questionnaires. Although self-report questionnaires are the most appropriate method to gather information regarding perceived social support and psychological functioning, other methods (e.g., interviews) and multiple informants should be used in future research. However, previous research has demonstrated that perceived social support (and not so much the actual received of social support) was associated with better functioning (Bolger, Zuckerman, & Kessler, 2000).

Third, besides being emotional in nature, social support can also be instrumental (provision of material aid) or informational (provision of relevant information) (Cohen, 2004). In Study 1, our parental support measure included mainly emotional aspects of support, but also instrumental aid, whereas in Study 2 we focused on emotional support, which could result in differences in the meaning of the social support clusters between adolescents with T1D and CHD. Hence, future research should focus on specific types of support and their differential relation to psychological functioning of adolescents with a chronic condition.

Fourth, in both studies, mainly mean-level differences among the four social support clusters in psychological functioning were found, and no differences in the development of psychological functioning over time were obtained, except for well-being in Study 1. Possible differences in such developmental trajectories might be found when using a wider temporal window well into young adulthood (Luyckx, Tildesley, et al., 2011). In sum, we encourage future research to examine long-term developmental implications of experienced social support in adolescents with a chronic condition.

Fifth, as data from control groups were not collected at multiple time-points for both studies, we did not compare trajectories of psychological functioning among patient and control samples. However, we encourage future research to compare such trajectories over time.

Conclusion

The present manuscript focused on social support as a potential determinant of psychological functioning in adolescents with a chronic condition (i.e., T1D and CHD). The fact that we found similar results in both studies despite some methodological differences between both studies testifies to the broader utility and relevance of assessing parental and peer support combined in these adolescents. In both studies, four social support clusters emerged: Combined support, Parental support, Peer support, and Lack of support. Follow-up longitudinal analyses indicated that especially the combined support from mothers, fathers, and peers proved to be of crucial importance towards psychological functioning in adolescents with a chronic condition, which is in line with adolescents' normative development (Collins & Laursen, 2004).

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Table 1

Baseline Parameter Estimates of Multigroup Latent Growth Curve Modeling in Studies 1-2

Parameters	Support clusters			
	Combined	Parental	Peer	Lack of support
		Study 1		
Internalising symptoms				
M intercept	9.096***[a]	11.604***	12.312***	15.687***[b]
M linear slope	-0.246	-0.953	-0.170	-0.475
Well-being				
M intercept	37.231***[b]	37.597***[b]	33.229***[a]	31.189***[a]
M linear slope	-4.274***	-4.783***[b]	-0.261[a]	-2.798*[a]
M quadratic slope	1.036***	1.066**[b]	-0.069[a]	0.858*[a]
HbA1c				
M intercept	7.262***	7.509***	7.507***	8.767***
M linear slope	0.587	-0.782	0.418	-0.279
M quadratic slope	-0.094	0.443[†]	-0.075	0.035
		Study 2		
Depressive symptoms				
M intercept	6.224***[a]	12.146***[c]	9.246***[b]	13.575***[c]
M linear slope	1.013	-0.303	-0.077	-1.530[†]
M quadratic slope	-0.172	0.214	0.086	0.272
Well-being				
M intercept	86.043***[c]	79.720***[a]	82.760***[b]	79.799***[a]
M linear slope	-0.973	-0.643	-0.468	0.137
M quadratic slope	-0.066	0.074	0.077	-0.126

Note. Within rows, intercepts and slopes differ at $p < .05$ if they have different superscripts. Parameters without superscripts do not differ significantly from other parameters.
[†]$p < .10$. *$p < .05$. ** $p < .01$. *** $p < .001$.

Figure 1

Z-scores for maternal support, paternal support, and peer support for the final four-cluster solution in Study 1.

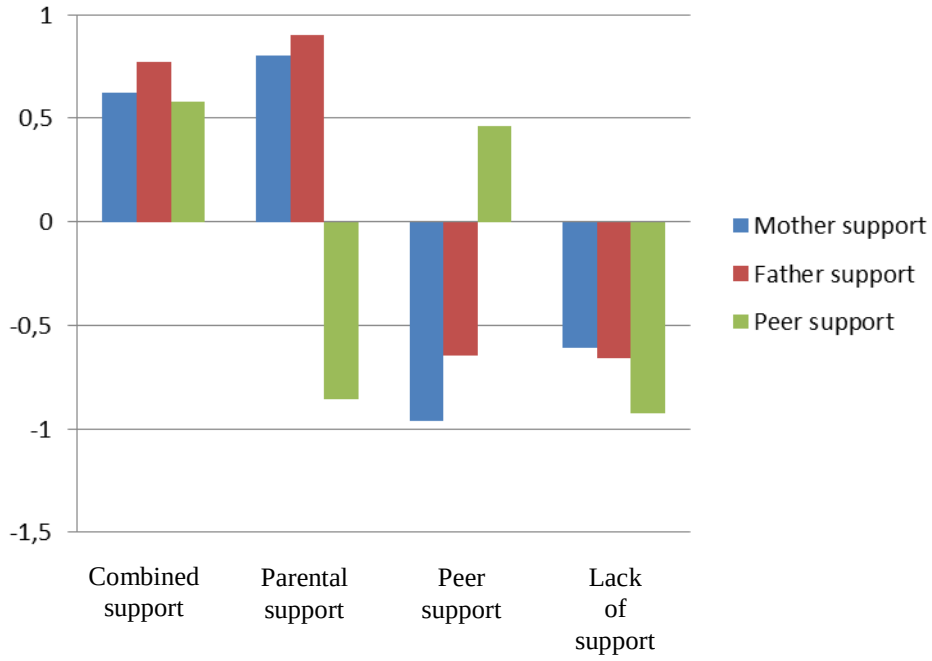

Figure 2

Z-scores for maternal support, paternal support, and peer support for the final four-cluster solution in Study 2.